**REMARKS**

This Amendment is in response to the Office Action dated October 6, 2004. In the Office Action, claims 1-4 and 9-12 were rejected under 35 USC §101, and claims 1-16 were rejected under 35 USC §103. By this Amendment, claims 1 and 9 are amended. Currently pending claims 1-16 are believed allowable, with claims 1, 5, 9 and 13 being independent claims.

**CLAIM REJECTIONS UNDER 35 USC §101:**

Claims 1-4 were rejected as pertaining to a mathematical algorithm and manipulation of an abstract idea with no application of the mathematical algorithm to the technological art. Office Action, paragraph 2.

Claim 1 presently reads, in part, "determining whether said number of errors equals the maximum number of correctable errors in the digital signal." It is respectfully submitted that this claim limitation imparts a useful concrete and tangible result by determining the whether the number of error equals the maximum number of correctable errors in the digital signal. Claims 2-4 are dependent on and further limit claim 1. Since claim 1 is believed to contain statutory subject matter, claims 2-4 are likewise believed to contain statutory subject matter.

Claims 9-12 were rejected as pertaining to a program not embodied in a tangible computer-readable medium. Office Action, paragraph 2.

Claim 9 presently reads, in part, "A program embodied in a tangible computer-readable medium for processing a digital signal." It is respectfully submitted that this claim limitation requires the program recited in claim 9 to be embodied in a tangible computer-readable medium. Thus, claim 9 is believed to contain statutory subject matter. Claims 10-12 are dependent on and further limit claim 9. Since claim 9 is believed to contain statutory subject matter, claims 10-12 are also believed to contain statutory subject matter.

**CLAIM REJECTIONS UNDER 35 USC §103:**

Claims 1-16 were rejected under 35 USC §103 as obvious over U.S. Patent Application Publication No. US 2001/0053225 A1 to Ohira et al.

(hereinafter "Ohira") in view of Zang et al., On the Methods for Solving Yule-Walker Equations, IEEE Transactions of Signal Processing, Vol. 40, No. 12 (Dec. 1992) (hereinafter "Zang") and further in view of U.S. Patent No. 4,694,455 to Koga et al. (hereinafter "Koga"). Office Action, paragraph 3.

A *prima facie* case for obviousness can only be made if the combined reference documents teach or suggest all the claim limitations. MPEP 2143.

Claim 1

Claim 1 of the present Application recites, in part,

employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$ (hereinafter referred to as $\Lambda_i^{hat(l)}$) to result in the calculation of the following determinants of the symmetric matrices

$$\Gamma_i^{(l+1)} = \begin{vmatrix} S_0 & \cdots & S_{l-1-i} & S_{l+1-i} & \cdots & S_l \\ \vdots & & \vdots & \vdots & & \vdots \\ S_{l-1-i} & \cdots & S_{2(l-1-i)} & S_{2(l-i)} & \cdots & S_{2l-1-i} \\ S_{l+1-i} & \cdots & S_{2(l-i)} & S_{2(l+1-i)} & \cdots & S_{2l+1-i} \\ \vdots & & \vdots & \vdots & & \vdots \\ S_l & \cdots & S_{2l-1-i} & S_{2l+1-i} & \cdots & S_{2l} \end{vmatrix}$$

(where $i = 0, \ldots, l$).

When Jacobi's formula is employed, the calculation of $\Lambda_i^{hat(l)}$ results in the calculation of $\Gamma_i^{(l+1)}$, which is the determinants of symmetric matrices. Since the calculations for the square root and the square calculations can be performed as linear calculations for $GF(2^m)$, these calculations can be implemented as a circuit substantially at the similar cost as that of an addition. Therefore, only a very small cost is required, compared with a multiplier that is a non-liner operating circuit. Since the characteristic of the $GF(2^m)$ is always 2 and all $\Gamma_i^{(l)}$ are symmetrical, the method of claim 1 cancels terms that are generated from arrangements that are asymmetrical to the diagonal line in the process for expanding the cofactor of determinants. Thus, when the method of claim 1 is used for a combinational circuit including multipliers, the required number of multipliers can be reduced.

It is respectfully submitted that none of the documents presented in the Office Action teach or suggest employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$, as recited in claim 1. Although the Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Jacobi's formula, no evidence is provided to support such a broad assertion. Furthermore,

> A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. MPEP 2143.01 *citing Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (emphasis in original).

Thus, it is respectfully submitted that Ohira, in combination with Zang and Koga do not teach or suggest all the limitations of claim 1. For at least this reason, claim 1 is allowable.

Claims 2-4

If an independent claim is nonobvious under 35 USC §103, then any claim depending therefrom is nonobvious. MPEP 2143.03 *citing In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Claims 2-4 are dependent on further limit claim 1. Since claim 1 is believed allowable, claims 2-4 are also believed allowable for at least the same reasons as claim 1.

Claim 5

Claim 5 of the present Application recites, in part,

means for employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$ (hereinafter referred to as $\Lambda_i^{hat(l)}$) to result in the calculation of the following determinants of the symmetric matrices

$$\Gamma_i^{(l+1)} = \begin{vmatrix} S_0 & \cdots & S_{l-1-i} & S_{l+1-i} & \cdots & S_l \\ \vdots & & \vdots & \vdots & & \vdots \\ S_{l-1-i} & \cdots & S_{2(l-1-i)} & S_{2(l-i)} & \cdots & S_{2l-1-i} \\ S_{l+1-i} & \cdots & S_{2(l-i)} & S_{2(l+1-i)} & \cdots & S_{2l+1-i} \\ \vdots & & \vdots & \vdots & & \vdots \\ S_l & \cdots & S_{2l-1-i} & S_{2l+1-i} & \cdots & S_{2l} \end{vmatrix}$$

(where $i = 0, \ldots, l$).

When Jacobi's formula is employed, the calculation of $\Lambda_i^{hat(l)}$ results in the calculation of $\Gamma_i^{(l+1)}$, which is the determinants of symmetric matrices. Since the calculations for the square root and the square calculations can be performed as linear calculations for GF($2^m$), these calculations can be implemented as a circuit substantially at the similar cost as that of an addition. Therefore, only a very small cost is required, compared with a multiplier that is a non-liner operating circuit. Since the characteristic of the GF($2^m$) is always 2 and all $\Gamma_i^{(l)}$ are symmetrical, the method of claim 5 cancels terms that are generated from arrangements that are asymmetrical to the diagonal line in the process for expanding the cofactor of determinants. Thus, when the method of claim 5 is used for a combinational circuit including multipliers, the required number of multipliers can be reduced.

It is respectfully submitted that none of the documents presented in the Office Action teach or suggest employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\widetilde{\Lambda}_i^{(l)}$, as recited in claim 5. Although the Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Jacobi's formula, no evidence is provided to support such a broad assertion. Furthermore,

> A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. MPEP 2143.01

*citing Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (emphasis in original).

Thus, it is respectfully submitted that Ohira, in combination with Zang and Koga do not teach or suggest all the limitations of claim 5. For at least this reason, claim 5 is allowable.

Claims 6-8

Claims 6-8 are dependent on further limit claim 5. Since claim 5 is believed allowable, claims 6-8 are also believed allowable for at least the same reasons as claim 5.

Claim 9

Claim 9 of the present Application recites, in part,

employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\widetilde{\Lambda}_i^{(l)}$ (hereinafter referred to as $\Lambda_i^{hat(l)}$) to result in the calculation of the following determinants of the symmetric matrices

$$\Gamma_i^{(l+1)} = \begin{vmatrix} S_0 & \cdots & S_{l-1-i} & S_{l+1-i} & \cdots & S_l \\ \vdots & & \vdots & \vdots & & \vdots \\ S_{l-1-i} & \cdots & S_{2(l-1-i)} & S_{2(l-i)} & \cdots & S_{2l-1-i} \\ S_{l+1-i} & \cdots & S_{2(l-i)} & S_{2(l+1-i)} & \cdots & S_{2l+1-i} \\ \vdots & & \vdots & \vdots & & \vdots \\ S_l & \cdots & S_{2l-1-i} & S_{2l+1-i} & \cdots & S_{2l} \end{vmatrix}$$

(where $i = 0, \ldots, l$).

When Jacobi's formula is employed, the calculation of $\Lambda_i^{hat(l)}$ results in the calculation of $\Gamma_i^{(l+1)}$, which is the determinants of symmetric matrices. Since the calculations for the square root and the square calculations can be performed as linear calculations for GF($2^m$), these calculations can be implemented as a circuit substantially at the similar cost as that of an addition. Therefore, only a very small cost is required, compared with a multiplier that is a non-liner operating circuit. Since the characteristic of the GF($2^m$) is always 2 and all $\Gamma_i^{(l)}$ are symmetrical, the method of claim 9 cancels terms that are generated from arrangements that are asymmetrical to the diagonal line in the process for expanding the cofactor of determinants. Thus, when the

method of claim 9 is used for a combinational circuit including multipliers, the required number of multipliers can be reduced.

It is respectfully submitted that none of the documents presented in the Office Action teach or suggest employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$, as recited in claim 9. Although the Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Jacobi's formula, no evidence is provided to support such a broad assertion. Furthermore,

> A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. MPEP 2143.01 *citing Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (emphasis in original).

Thus, it is respectfully submitted that Ohira, in combination with Zang and Koga do not teach or suggest all the limitations of claim 9. For at least this reason, claim 9 is allowable.

Claims 10-12

Claims 10-12 are dependent on further limit claim 9. Since claim 9 is believed allowable, claims 10-12 are also believed allowable for at least the same reasons as claim 9.

Claim 13

Claim 13 of the present Application recites, in part,

employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$ (hereinafter referred to as $\Lambda_i^{hat(l)}$) to result in the calculation of the following determinants of the symmetric matrices

$$\Gamma_i^{(l+1)} = \begin{vmatrix} S_0 & \cdots & S_{l-1-i} & S_{l+1-i} & \cdots & S_l \\ \vdots & & \vdots & \vdots & & \vdots \\ S_{l-1-i} & \cdots & S_{2(l-1-i)} & S_{2(l-i)} & \cdots & S_{2l-1-i} \\ S_{l+1-i} & \cdots & S_{2(l-i)} & S_{2(l+1-i)} & \cdots & S_{2l+1-i} \\ \vdots & & \vdots & \vdots & & \vdots \\ S_l & \cdots & S_{2l-1-i} & S_{2l+1-i} & \cdots & S_{2l} \end{vmatrix}$$

(where $i = 0, \ldots, l$).

When Jacobi's formula is employed, the calculation of $\Lambda_i^{hat(l)}$ results in the calculation of $\Gamma_i^{(l+1)}$, which is the determinants of symmetric matrices. Since the calculations for the square root and the square calculations can be performed as linear calculations for $GF(2^m)$, these calculations can be implemented as a circuit substantially at the similar cost as that of an addition. Therefore, only a very small cost is required, compared with a multiplier that is a non-liner operating circuit. Since the characteristic of the $GF(2^m)$ is always 2 and all $\Gamma_i^{(l)}$ are symmetrical, the method of claim 13 cancels terms that are generated from arrangements that are asymmetrical to the diagonal line in the process for expanding the cofactor of determinants. Thus, when the method of claim 13 is used for a combinational circuit including multipliers, the required number of multipliers can be reduced.

It is respectfully submitted that none of the documents presented in the Office Action teach or suggest employing Jacobi's formula, $\Gamma_i^{(l+1)}\Lambda_0^{hat(l)} + (\Lambda_1^{hat(l)})^2 = \Lambda_0^{hat(l+1)}\Gamma_i^l$, to enable the calculation of the solution $\tilde{\Lambda}_i^{(l)}$, as recited in claim 13. Although the Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Jacobi's formula, no evidence is provided to support such a broad assertion. Furthermore,

> A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. MPEP 2143.01

*citing Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (emphasis in original).

Thus, it is respectfully submitted that Ohira, in combination with Zang and Koga do not teach or suggest all the limitations of claim 13. For at least this reason, claim 13 is allowable.

Claims 14-16

Claims 14-16 are dependent on further limit claim 13. Since claim 13 is believed allowable, claims 14-16 are also believed allowable for at least the same reasons as claim 13.

**CONCLUSION**

In view of the forgoing remarks, it is respectfully submitted that this case is now in condition for allowance and such action is respectfully requested. If any points remain at issue which the Examiner feels could best be resolved by a telephone interview, the Examiner is urged to contact the attorney below.

No fee is believed due with this Amendment, however, should a fee be required please charge Deposit Account 50-0510. Should any extensions of time be required, please consider this a petition thereof and charge Deposit Account 50-0510 the required fee.

Respectfully submitted,

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